Integration of Nanocomposites and Nanohybrids for Catalytic Applications

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Our research is focused on integration of nanocomposites and nanohybrids (i.e., integrated nanocatalysts) for green fuel technology such as hydrogenation of CO2 to methanol. In preparing such new catalysts, various synthetic approaches have been developed in recent years [1-7]. Normally, the primary catalytic phases are synthesized into monodisperse nanoparticles through wet chemical routes, while the hosting matrixes are often prepared as porous and/or hollow supports through soft synthetic approaches with desired structural complexity and chemical functionality which are accessible to reaction constituents. In particular, integration of different catalytic components can be achieved in a step-by-step manner. Both top-down and bottom-up strategies have been employed in this type of synthetic architecture, benefiting from rapid advancement of nanoscience and nanotechnology as well as the maturing chemistry of materials. It is anticipated that structural and compositional requirements of such state-of-the-art nanocatalysts can be met at a higher level of sophistication and precision but at a much lower cost in future. Toward this goal, synthetic architecture of porous materials will continue to be an important field in future development of catalyst technology. Further investigation and invention of integrative methodology will lead to even more powerful catalysts, achieving an industrial scale of applications.

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